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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/654,776	09/05/2000	Chia-Ta Hsieh	TSMC98-231B	9675

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EXAMINER

LOKE, STEVEN HO YIN

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 04/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/654,776

Applicant(s)

HSIEH ET AL.

Examiner

Steven Loke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 22 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 29 and 33-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 29 and 33-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on 22 January 2002 is: a) ☐ approved b) ☒ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

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1. The amended drawing is objected to because there is no reference numeral 10 (page 3) in amended fig. 1. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawing will not be held in abeyance.

2. Claims 29 and 33-35 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification never discloses an oxide liner formed over the substrate as claimed in claim 29.

3. Claims 34 and 35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 34, line 2, "said first conductive layer" has no antecedent basis.

In claim 35, line 2, "said second conductive layer" has no antecedent basis.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 29 and 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doan et al. in view of Sze.

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In regards to claim 29, Doan et al. discloses a stacked-gate flash memory having a shallow trench isolation with a high-step oxide (the upper portion of oxide [42]) in figs. 2A-3, comprising: a substrate [32] having a gate oxide layer [44]; at least two trenches formed below the surface of the substrate; a high-step oxide formed within the two trenches and protruding upward over the surface of the substrate; the high-step oxide forming an opening with high walls over the surface of the substrate between the two trenches; a first polysilicon layer [46] formed conformally inside the opening and over the surface of the substrate between the high walls to form a floating gate having folding surfaces; an integrate oxide [48] formed over the floating gate [50] having folding surfaces; a second polysilicon layer [54] formed protruding downward in between the folding surfaces over the integrate oxide layer [48] to form a control gate.

Doan et al. differs from the claimed invention by not showing the depth of the trenches and the height of the high-step oxide.

Sze shows a silicon oxide of thickness x consumes a layer of silicon $0.44x$ thick in a thermal oxidation process.

Therefore, according to the formula of Sze, the depth of the trenches formed by the field oxide [42] in Doan et al. is 0.44 times $(6000 \text{ angstroms}) = 2640 \text{ angstroms}$. The height of the high-step oxide is $(6000 - 2640) \text{ angstroms} = 3360 \text{ angstroms}$.

It would have been obvious to have an oxide layer formed over the substrate, including over the inside walls of the two trenches because it isolates a memory cell from the other memory cell.

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It would have been obvious to have a self-aligned source line because it is a conventional structure in a flash memory array.

In regards to claim 33, it would have been obvious for the opening has a width between about 1500 to 5000 angstrom because it depends on the memory cell density in the substrate.

In regards to claim 34, it would have been obvious for the first polysilicon layer has a thickness between about 100 to 500 angstrom because it depends on the memory cell density in the substrate.

In regards to claim 35, it would have been obvious for the second polysilicon layer has a thickness between about 1000 to 3000 angstrom because it depends on the memory cell density in the substrate.

6. Applicant's arguments filed 1/22/02 have been fully considered but they are not persuasive.

It is urged, in page 11 of the remarks, that the referenced memory cells are constructed over the field oxides, as differentiated from the trench oxides that the instant invention employs. In addition, the structure of a trench is different from field oxides, primarily due to the depth of the trenches. However, the field oxides of Doan et al. are also formed in trenches. Therefore, they are considered as field oxides. In addition, the depth of the trenches in Doan et al. is 2640 angstroms, which meets the limitation of the claimed invention.

It is urged, in page 12 of the remarks, that the high-step oxide used in the instant invention is likewise different structurally from a field oxide because of the height that

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can be formed with a high-step oxide. However, the height of the field oxide of Doan et al. is 3360 angstroms, which meets the limitation of the claimed invention.

It is urged, in page 12 of the remarks, that the reference does not show the inside walls of the opening that is formed in between the high-step oxide makes it possible to form a floating gate with tall folding surfaces to provide high coupling between the floating gate and the word line over the control gate. However, Doan et al. does disclose the inside walls of the opening that is formed in between the high-step oxide makes it possible to form a floating gate with tall folding surfaces to provide high coupling between the floating gate and the word line over the control gate.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Loke whose telephone number is (703) 308-4920. The examiner can normally be reached on 7:50 am to 5:20 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

sl
March 26, 2002

Steven Loke